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United States Government Accountability Office
Washington, DC 20548

May 28, 2010

Congressional Committees

Subject: *Warfighter Support: Observations on DOD's Ground Combat Uniforms*

This report transmits the attached briefing (see enclosure I) in response to section 352 of Public Law 111-84, the National Defense Authorization Act for Fiscal Year 2010. The statute requires the Comptroller General to conduct an assessment of the ground combat uniforms and camouflage utility uniforms currently in use in the Department of Defense and provide the results to the congressional defense committees not later than 180 days after the date of enactment of the act. On April 26, 2010, we provided a briefing on the results of our assessment to your committees' staffs to satisfy this requirement. We also provided the Department of Defense an opportunity to comment on the briefing. The department provided us with technical comments, which we have incorporated as appropriate.

We are sending copies of this report to the appropriate congressional committees. We are also sending copies to the Secretary of Defense; the Secretaries of the Army, Navy, and Air Force; and the Commandant of the Marine Corps. This report will also be available at no charge on our Web site at <http://www.gao.gov>. Should you or your staff have any questions concerning this report, please contact me at (202) 512-8365 or solisw@gao.gov. Contact points for our Offices of Congressional Relations and Public Affairs may be found on the last page of this report. Key contributors to this report were Larry Junek, Assistant Director; Meghan Cameron, Susan Ditto, Elizabeth Morris, and Michael Shaughnessy.

William M. Solis
Director, Defense Capabilities and Management

Enclosure

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Warfighter Support: Observations on DOD's Ground Combat Uniforms

May 28, 2010

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Introduction to DOD's Ground Combat Uniforms

- Prior to Operation Enduring Freedom and Operation Iraqi Freedom, the military services wore similar desert camouflage uniforms.
- The Defense Logistics Agency, Defense Supply Center Philadelphia (DSCP) currently manages eight uniforms for the services. Three additional ground combat uniforms are under development by the Army (1) and the Navy (2).
- Congress has expressed interest in the costs of managing service-specific uniforms, the impact of proprietary¹ information on the ability of the services or Special Operations Command to share uniform technology, and the potential risk to individuals—such as airmen or sailors assigned to Army or Marine Corps units, interpreters, and other support personnel—who may be wearing a different uniform than members of the unit they are supporting.

¹ Proprietary generally refers to a distinct aspect or feature of an item, in which the owner has a protectable interest—such as a trade secret.

Introduction to DOD's Ground Combat Uniforms

- Congress has also noted that the design and fielding of future ground combat and camouflage utility uniforms of the Armed Forces may uniquely reflect the identity of the individual military services, as long as the uniforms, to the extent practical, provide an equivalent level of performance, functionality, and protection commensurate with their respective assigned combat missions; minimize risk to the individual soldier, sailor, airman, or marine operating in the joint battlespace; and provide interoperability with other components of individual war fighter systems, including body armor and other individual protective systems.
- Section 352 of the National Defense Authorization Act (NDAA) for Fiscal Year 2010² requires GAO to review performance, interoperability, costs and logistics, and patents or other proprietary elements involved in the services' ground combat uniforms,³ as well as the risks associated with individuals wearing different ground combat uniforms. (See appendix I.)

² Pub. L. No. 111-84, § 352(b) (2009).

³ For our purposes, we use the term ground combat uniform to include the services' camouflage utility uniforms.

Ground Combat Uniform Production Standards and Patents

- Each ground combat uniform has production specification requirements that follow manufacturing standards for the production of the uniform. These standards include color fastness (fading), fabric durability, consistent pattern printing, color matching to ensure camouflage shade consistency, and visible and near infrared wavelength ranges.
- Uniforms may also have capability requirements such as flame resistance or insect repellency.
- Camouflage patterns are characterized as environment-specific or universal. Environment-specific patterns, such as the Marine Corps woodland and desert patterns, are expected to perform best in the specific environment.
- The Defense Supply Center Philadelphia, the troop support center for clothing and textiles for the Defense Logistics Agency, maintains a central role in production, procurement, storage, and distribution of most ground combat uniforms used by the services. As a working capital fund, the supply center relies principally on sales revenue rather than direct appropriations to finance its operations. Customers primarily use operation and maintenance funds to finance orders.
- The services' ground combat uniforms were funded or plan to be funded through annual appropriations or Overseas Contingency Operations appropriations.
- Since 2002, the Department of the Navy and Marine Corps have held patents⁴ for elements of the Marine Corps Combat Utility Uniform (MCCUU)—color scheme, uniform design, and pattern (including the service logo). The Marine Corps holds the patent to prevent the uniform from being copied commercially and to ensure the Marine Corps' uniqueness.

⁴ Patents provide a property right granted by the U.S. government to the patent holder to exclude others from making, using, offering for sale, or selling the invention in the United States.

DOD and the Services Oversee Ground Combat Uniforms

- Joint Clothing and Textiles Governance Board
 - Department of Defense Instruction 4140.63 directs the Director of the Defense Logistics Agency to establish and chair the board to ensure collaboration and integration of clothing and textile activities.
 - Section 352(d) of the NDAA for Fiscal Year 2010 requires the secretaries of the military departments to establish joint criteria for future ground combat uniforms. According to Department of Defense officials, the board will be the venue used to accomplish this.
- Service Uniform Boards are responsible for overseeing aspects of uniform changes within each service.
- The Cross Service Warfighter Equipment Board provides a structure for sharing uniform technology.
 - U.S. Army Natick Soldier Research, Development, and Engineering Center (NSRDEC) is the coordinating agency for the board.
 - The advisory board facilitates and provides guidance to establish, plan, and manage joint service technology advancements.

To address the legislation (see appendix I), our specific objectives were to assess:

1. the extent to which ground combat camouflage uniforms meet standards for performance in combat environments and interoperability with currently issued protective gear and body armor
2. the costs and logistics requirements associated with developing, fielding, and supporting service-specific ground combat uniforms
3. the extent to which patents and proprietary information preclude sharing of advanced uniform design technology across the services and Special Operations Command
4. challenges and risks, if any, including tactical risk, associated with individuals serving in combat assignments where different ground combat uniforms are used

- Our review focused on the current Army, Air Force, Navy, and Marine Corps ground combat uniforms and the development of future ground combat uniforms.
- To determine the extent to which ground combat uniforms meet standards for performance in combat environments, we reviewed uniform specifications provided by the Defense Supply Center Philadelphia and the services. We analyzed uniform performance feedback provided by the Army, Marine Corps, and Air Force. We discussed performance standards and feedback for combat environments with officials from all four services. To assess the extent to which ground combat uniforms are operable with protective gear and body armor, we discussed operability of uniforms and protective gear with service and Special Operations Command officials. We did not test uniforms and protective gear for interoperability.
- To assess costs and logistics support requirements with the design, development, production, procurement, and fielding of service-specific ground combat uniforms, we analyzed uniform budget and cost estimate data on current and planned ground combat uniforms from all four services, the Defense Supply Center Philadelphia, and commercial entities. To determine the reliability and accuracy of the Army, Navy, and Marine Corps cost estimates, we used the GAO Cost Estimating and Assessment Guide. (See appendix V.) We found that the data were sufficiently reliable for the purpose of reporting costs and trends in costs.

- To determine the extent to which patents and proprietary information might preclude sharing of advanced uniform technology, we identified elements of the uniforms that are patented or proprietary and discussed the impact of this on sharing of technology with services and Special Operations Command.
- To assess the challenges and risks associated with individuals serving in combat assignments where different ground combat uniforms are worn; we analyzed the uniform policies of the combatant commands and service components of U.S. Central Command and discussed risks to augmentees, interpreters, and other support personnel with service and Special Operations Command officials.
- We conducted this performance audit in accordance with generally accepted government auditing standards (GAGAS). For further details on our scope and methodology, see the scope and methodology section and appendix V.
- We received technical comments from the services, the Defense Logistics Agency, U.S. Central Command, and U.S. Special Operations Command, which we incorporated as appropriate.

Objective 1:

- Although the Army, Air Force, and Marine Corps state that they have established requirements for combat clothing that include performance capabilities and characteristics, we found that performance standards are not related to specific combat environments. In addition, we found technical production standards guide the manufacturing of uniforms for all four services. Camouflage effectiveness is not an operational performance criteria.
- Service and Special Operations Command officials indicate that the ground combat uniforms and their protective gear and body armor are interoperable. However, service officials stated that they do not have a requirement to regularly test their uniform and other services' protective gear for interoperability, but rely on feedback from users.

Objective 2:

- Production and procurement costs are increasing and account for about 95 percent of ground combat uniform costs. Several factors, such as the introduction of flame resistant fabric and pace of operations, account for the increase in production costs. According to DOD officials, supporting a variety of uniforms in any combat theater of operations does not place additional logistics requirements on the distribution system; rather, the additional logistical requirements are primarily found in storage costs in the United States.

Objective 3:

- The government-owned patents on elements of the Marine Corps' ground combat uniforms—the color scheme, the uniform design, and the pattern with the service logo—present no legal barrier to allowing other services to use these elements. According to officials from all four services, it is unlikely that the services would choose to wear the same camouflage uniform because it is a symbol of the individual service and its uniqueness. Apart from the patents issue, Marine Corps System Command officials indicated that they believe 10 U.S.C. § 771 prohibits a member of one service from wearing the uniform or a distinctive part of the uniform belonging to another service.

Objective 4:

- The services and U.S. Central Command (CENTCOM) officials do not collect data that would enable an assessment of the risks associated with wearing different uniforms in combat operations. Combatant commanders and service component commanders maintain flexibility to determine uniform wear based on operational needs.

Objective 1: The Services Have Some Overall Requirements for Uniform Performance

- The Army, Air Force, and Marine Corps state that they have established requirements for combat clothing that include performance capabilities and characteristics.
- The Army issued a capability production document for its Core Soldier System—which includes its combat uniform—in 2007, which provides parameters for capabilities such as temperature endurance, durability, and protection against insect bites.
- The Air Force’s Independent Uniform Review team identified some uniform performance requirements, including one uniform for all climates, useful in brown and green environments, similar design with service-specific pocket placement and closures.
- The Marine Corps issued an operational requirements document in 1994 that specifies its priorities for weight, service life, infrared reflective quality, protective gear compatibility, woodland camouflage, and other clothing characteristics.
- Navy officials told us that the Navy is determining performance standards to meet all environments for the Navy’s Working Uniform (NWU) Type II and Type III uniforms.

Objective 1: Uniform Performance Standards Do Not Relate to Specific Ground Combat Environments

- We found that the services' performance standards for design and development of their uniforms are not related to specific combat environments.
 - The Army's document states that the Core Soldier System must operate in all environments including snow, ice, rain, sand, dust, and saltwater.
 - The Marine Corps' document proposes a uniform to meet a temperate climate on varied terrain that will meet unique conditions required of Marine combat forces.
 - The services develop production specifications based on military and commercial standards, such as from the American Society for Testing and Material, which include some technical standards. For example, the purchase description for the Air Force man's utility uniform camouflage pattern coat states that the lining shall meet initial minimum directional bond strength of 32 ounces per inch and a minimum 24 ounces per inch after 20 launderings.

Objective 1: Camouflage Effectiveness Is Not an Operational Performance Criteria for Uniforms

- Camouflage effectiveness is not an operational performance criteria of the services' ground combat uniforms.
- Natick Soldier Research, Development, and Engineering Center and most of the services tested the camouflage patterns in different environments during design and development testing phase during the selection of new ground combat uniforms.
- Based on available data, it is not possible to fully assess the camouflage effectiveness of each services' uniform in different combat environments because of limitations in studies and different concepts of camouflage performance.
 - Some limitations of these studies include:
 - Not all of the services' ground combat uniforms were included
 - A limited number of environments were included
 - Not all seasons were included in background photographs

Objective 1: Services Use Various Mechanisms to Gather Ground Combat Uniform Performance Feedback

- The services utilize feedback mechanisms to obtain overall performance data to inform uniform improvements.
 - The Army utilizes a Program Executive Office Soldier Web site and U.S. Army Maneuver Center of Excellence post deployment surveys. Generally, the feedback has included concerns about uniform fading, durability, and laundering.
 - The Marine Corps uses surveys, user evaluations, theater urgent needs statements, and in-theater town hall meetings. Generally, the feedback has included concerns about durability and laundering.
 - The Air Force uses a Uniform Board Web site, theater urgent needs statements, and user evaluations. Generally, the feedback has included concerns about the weight of the uniform fabric and durability.
 - The Navy utilizes their administrative chain of command to provide the Navy Uniform Board feedback. The Navy did not provide any feedback on the ground combat uniform worn by the sailors.

Objective 1: Example of Army Utilization of Performance Feedback Mechanism

- The Army responded to feedback by addressing uniform durability concerns.
 - In August 2005, the Army Program Manager for ground combat uniforms received soldier feedback on seam rips on the trousers of the Army Combat Uniform.
 - In September 2005, Defense Supply Center Philadelphia included seam improvements to the trouser to address feedback.
 - In April 2007, after testing, Army Combat Uniform trousers in inventory were retrofitted with material to improve the strength of the seams.
 - In June 2010, Defense Supply Center Philadelphia will begin delivery of an improved trouser seam design on the Army Combat Uniform in response to soldier feedback.

Objective 1: Services Indicate That Ground Combat Uniforms and Protective Gear Are Interoperable

- Service and Special Operations Command officials indicate that the ground combat uniforms and protective gear and body armor are interoperable.⁵
- Air Force officials told us that the Air Force uniform is interoperable with the Army's protective gear. The Air Force's ground combat uniform system requirements included interoperability with the Army's body armor.
- Navy officials told us that the sailors' uniforms are interoperable with the Marine Corps, Army, and Special Operations Forces protective gear.
- However, service officials stated that they do not have a requirement to regularly test their uniform and other services' protective gear for interoperability, but rely on feedback from users. Natick Soldier Research, Development, and Engineering Center has the capability to conduct testing of uniforms and protective gear.
- There are differences of opinion about the interoperability of matching and nonmatching camouflage patterns.
- An Army Natick study indicates that the matching camouflage patterns for uniforms and protective gear in the Afghanistan environments blended better than nonmatching uniforms and protective gear.

⁵ For the purposes of this report, interoperability is the compatibility of the uniform to protective gear and the compatibility of camouflage colors to support combat operations.

Objective 2: Production and Procurement Costs Account for Most of the Uniform Costs

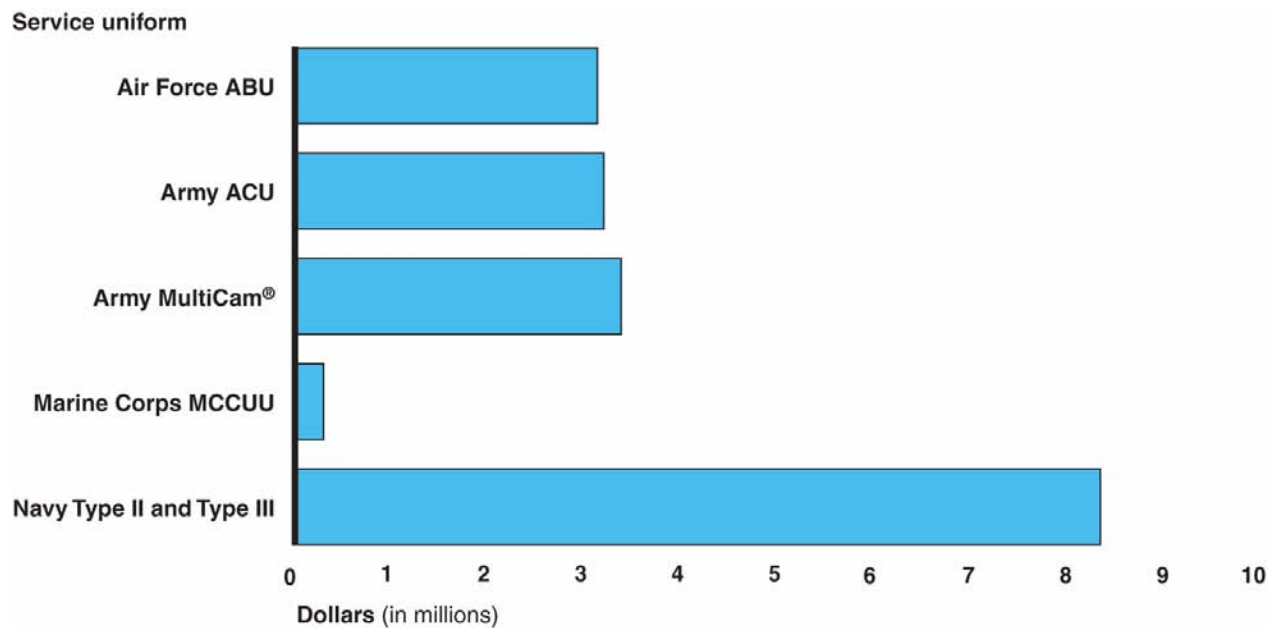
- Data on the design, development, production, procurement, and fielding of ground combat uniforms include cost estimates from the Marine Corps, Army, and Navy, and budget data from the Air Force and Defense Supply Center Philadelphia.
- Comparing overall costs of uniforms, the production and procurement of uniforms account for most (95 percent) of the services' and Defense Supply Center Philadelphia's ground combat uniform costs, with about 4 percent for storage and distribution costs, and about 1 percent design and development costs. (See appendix III, table 2.)

Objective 2: Service-Specific Design and Development Costs Are about 1 Percent of Overall Ground Combat Uniform Costs

- Design and development costs generally include initial manufacturing of uniform prototypes, conducting user evaluations, and material testing.
 - The kind of testing and the length of time testing is performed contributes to the varying costs of the services.
- The design and development cost (figure 1) of the uniforms⁶ include:
 - Air Force's Airman Battle Uniform (ABU)
 - Army's Army Combat Uniform (ACU)
 - Army's MultiCam®
 - Marine Corps' Combat Utility Uniform desert and woodland (MCCUU)
 - Navy's Navy Working Uniform (NWU) Type II and Type III
- The costs incurred for the design and development of the uniforms occurred in different years from 2001 to 2010.

⁶ For photos and additional information about each uniform type, see appendix II.

Objective 2: Figure 1. Design and Development Costs for the Services' Current and New Ground Combat Uniforms



Source: GAO analysis of the military services' design and development costs.

Source: GAO analysis of the military services' design and development costs.

Note: Timeframe for design and development costs: Air Force's ABU 6 years (FY 2003-FY 2008); Army's ACU 2 years; (FY 2004-FY 2005), MultiCam® 4 years (FY 2006-FY 2009); Marine Corps' MCCUU 1 year (FY 2001); and Navy's Type II/Type III 6 years (FY 2005-FY 2010). The Navy's design and development testing was performed by Naval Special Warfare.

Objective 2: Flame Resistant and Insect Repellant Treatments Are Among Factors Impacting the Increase in Uniform Production and Procurement Costs

- According to officials, increased costs are affected by new uniform specifications, such as flame resistant material, permanent press material, and permethrin insect repellant treatment; the number of service personnel deploying; and the overall pace of combat operations, including wear and tear in the austere environment of Afghanistan. For additional information on the specifications and unit costs for each uniform, see table 1.
- However, Defense Supply Center Philadelphia officials are unable to attribute increases in production and procurement costs directly to the increase in the number of new service-specific ground combat uniforms since fiscal year 2005.

Objective 2: Table 1. Ground Combat Uniform Characteristics and Unit Cost

Uniform	Flame resistant	Insect repellant permethrin treatment	Cloth treatment	Unit costs
Air Force ABU (Man's)			Permanent press	\$76.20
Air Force ABU (Woman's)			Permanent press	75.40
Air Force ABE (Man's)	X			203.34
Air Force ABE (Woman's)	X			200.53
Army ACU			Wrinkle free	75.85
Army ACU	X		Wrinkle free	129.61
Army ACU	X	X	Wrinkle free	152.34
Army MultiCam ®	X	X		173.93
Marine Desert		X	Permanent press	77.90
Marine Woodland		X	Permanent press	77.65
Navy DCU Desert				61.61
Navy CUU Woodland				48.86
Navy NWU Type II/Type III				83.00

Source: GAO analysis of Defense Supply Center Philadelphia, Air Force, Army, Marine Corps, and Navy data.

Objective 2: Some Accessory Costs Exceed Uniform Costs

- Costs of ground combat uniform accessories (such as body armor, load bearing equipment, and helmets) can be more expensive than the ground combat uniform.⁷
- For example:
 - The Army's flame-retardant combat uniform costs about \$130, while the Army's Modular Light-Weight Load-Carrying Equipment currently costs \$464 per unit.
 - The Marine Corps' combat utility uniform currently costs about \$78, while its body armor vests cost \$1,071.⁸

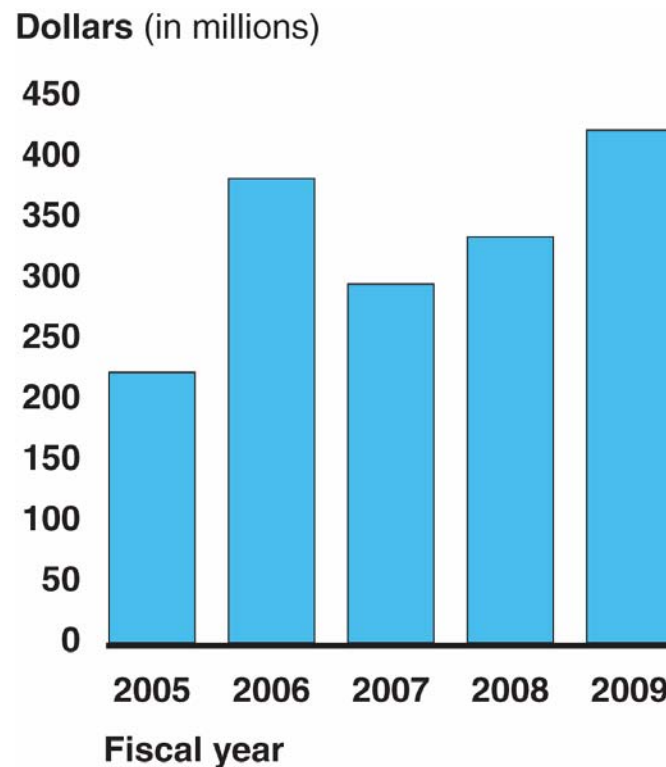
⁷ While ground combat uniform accessories are costly, they are not included in the scope of this engagement.

⁸ Does not include all armor.

Objective 2: Production and Procurement Costs Are Most of Uniform Costs and Have Increased Over Time

- During fiscal years 2005-2009, production and procurement costs for ground combat uniforms represented approximately 95 percent of the overall costs spent by the services and Defense Supply Center Philadelphia on camouflage uniforms. (See appendix III, table 2.)
- Figure 2 shows that Defense Supply Center Philadelphia's cost to produce and procure the services' ground combat uniforms have increased from about \$223 million in fiscal year 2005 to about \$422 million in fiscal year 2009.
 - An increase in the number of the Army's ACU sold and the introduction of the Air Force's ABU in fiscal year 2006, and an increase in the number of flame resistant uniforms sold during this period contributed to the increase in production and procurement costs.

Objective 2: Figure 2. Total Production and Procurement Costs Have Increased From Fiscal Year 2005-2009



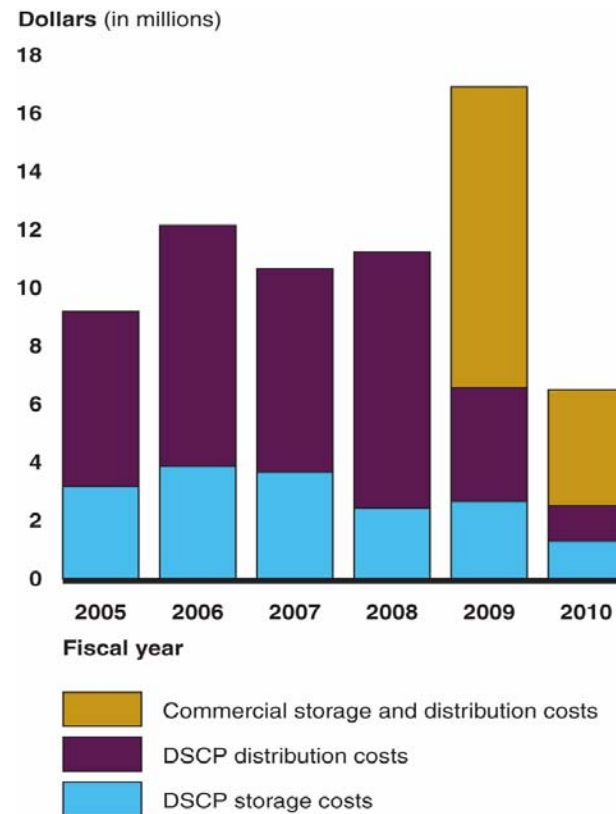
Source: GAO analysis of DSCP ground combat uniform obligations.

Source: GAO analysis of DSCP ground combat uniform obligations.

Note: Procurement and production costs are represented by Defense Supply Center Philadelphia's obligations for service ground combat uniforms from fiscal year 2005-fiscal year 2009. These costs include the production cost and its administrative cost to manage the production contracts.

Objective 2: Figure 3. Uniform Storage and Distribution Costs Have Increased From Fiscal Year 2005-2010

- According to Defense Supply Center Philadelphia officials, an increase in the number of uniform sizes and in the variety of different uniforms stored in warehouse storage space has increased storage costs in the United States. (See figure 3.)
- The fiscal year 2005-2010 storage and distribution costs account for approximately 4 percent of the overall costs spent by services, Defense Supply Center Philadelphia and commercial entities on camouflage uniforms. (See appendix III, table 2.)



Source: GAO Analysis of DSCP and commercial costs for storing clothing and textiles and accessories.

Note: FY10 costs include 4 months for DSCP and 5.5 months for the commercial entities.

Note: Officials indicated that due to Base Closure and Realignment Commission (BRAC) decisions, commercial entities began incurring storage and distribution costs in 2009. Commercial and DSCP storage costs include other accessories and clothing aside from uniforms and are for storage in the continental U.S. (CONUS) only. Service specific storage costs are not included in the graph above.

Objective 2: Managing Multiple Uniforms Involves Additional Logistical Requirements in the U.S., but Fielding Multiple Uniforms in Theater Does Not Clearly Require Additional Logistics Support

- According to DOD officials, supporting a variety of uniforms in any combat theater of operations does not place additional logistics requirements on the distribution system in theater. Rather, the additional logistical requirements to support multiple uniforms are primarily found in storage costs in the United States. Additionally:
 - Military personnel deploying to Central Command are issued four to six sets of their ground combat uniform.
 - If all uniforms issued for deployment wear out, service members may order replacements through their services' theater supply system.
- Distribution of uniforms is difficult in the Afghanistan environment. Challenges to supplying uniforms in Afghanistan are the same as those for supplying other types of equipment.

Objective 2: Services Incur Additional Cost for Their Own U.S. Storage Facilities for Uniforms and Equipment

In addition to DSCP and commercial storage costs, the Army and Air Force store uniforms and other equipment to support deployment. These costs include:

- An annual cost of approximately \$970,000 to store Army ground combat uniforms in the United States.
 - The Army uses its facilities to stage uniforms to support deployment preparation.
- An annual cost of about \$350,000 to store Army uniforms and other personal equipment in Afghanistan.
- Approximately \$5.7 million for fiscal year 2010, an increase of about \$2.3 million from fiscal year 2009, to store additional Air Force ground combat uniforms, other equipment, and clothing accessories.

Objective 2: Army and Navy are Developing New Ground Combat Uniforms

- The Army and Navy are in the process of developing and fielding three new ground combat uniforms.
- The Army is preparing to field a MultiCam® camouflage uniform to Soldiers deploying to Afghanistan.
 - The most recent Army estimate to field MultiCam® uniforms and accessories to 34,000 Soldiers deploying to and in Afghanistan is approximately \$86.7 million.
- The Navy is developing its Type II and Type III ground combat uniforms for Naval Special Warfare, Naval Expeditionary Combat Command, and expeditionary Navy units.
 - The most recent Navy estimate to field the Type II and Type III uniforms to 61,000 Navy personnel is approximately \$74 million.⁹

⁹ Navy officials recently indicated that an additional \$5 million has been added to the estimate for the Navy insignia and helmet covers for the uniforms.

Objective 2: Army and Navy Cost Estimates Do Not Fully Account for the Risk of Increases Due to Changes in Assumptions or Cost Drivers

- The Army's cost estimate for its MultiCam® and the Navy's cost estimates for its Type II and Type III ground combat uniforms are well-documented, comprehensive, and accurate. However, the estimates do not fully account for risk of cost increases due to changes in assumptions or cost drivers.
- The Army's estimate could change. Final contracting costs to print MultiCam® are uncertain due to the small initial contracts used to initiate production and current limited industry capabilities to print the pattern. According to Army officials, since there is only one company licensed to print MultiCam® the printing costs may be higher than expected. Program Executive Office Soldier officials stated that additional printers will be licensed by the private vendor.
- The Navy's estimate is also at risk for change. The timing and amount of Overseas Contingency Operations funds or annual budget funds to produce the Type II and Type III uniforms are unknown, and Navy officials told us that if the Navy receives a limited amount of funding it may have to purchase fewer uniforms at a higher contract cost.
- GAO's Cost Estimating and Assessment Guide identifies 12 steps to developing high quality cost estimates that are well-documented, comprehensive, accurate, and credible. For additional information, see appendix V.

Objective 3: Government-Owned Patents Present No Legal Barrier to Allowing Use by Other Services

- The government-owned patents on elements of the Marine Corps' ground combat uniforms—the color scheme, the uniform design, and the pattern with the service logo—present no legal barrier to allowing other services to use these elements.
- Service officials from all four services state that it is unlikely that the services would choose to wear the same camouflage uniform because the camouflage uniform is a symbol of the individual service and its uniqueness. However, the services were wearing similar desert camouflage and battle dress uniforms prior to Operation Enduring Freedom.
 - The Marine Corps and Department of the Navy hold patents for the Marine Corps Combat Utility Uniform (MCCUU) color scheme, design, and pattern.
 - Navy officials stated that the Navy is considering obtaining a patent for the Type II and Type III uniform. The Navy will include an embedded anchor, the Constitution, and an eagle emblem on the uniforms.
- Apart from the patents issue, Marine Corps System Command officials indicated that they believe 10 U.S.C. § 771 prohibits a member of one service from wearing the uniform, or a distinctive part of the uniform, such as a service emblem, belonging to another service. However, Combatant Commanders and Service Component Commanders maintain flexibility to determine which uniform is worn based on operational needs.
- The Army is using a flame resistant rayon fabric blend, patented by a private company, for their flame resistant uniform. In addition, Marine Corps officials confirmed that they use the same material in their flame resistant clothing.¹⁰

¹⁰ Air Force officials indicated that they use a material from a different manufacturer for their flame resistant uniform.

Objective 3: Proprietary Issue Could Hamper the Army's Production of Its MultiCam® Uniform

- The services have not used proprietary elements of another service's ground combat uniform.
- Licensing considerations have the potential to impact the use of patented technology or other proprietary information.
 - Special Operations Command officials indicated that the future sharing of MultiCam® technology could be affected if licensing is not granted by the vendor.
 - The Army indicated that there currently is only one printer licensed by the MultiCam® supplier, resulting in potentially higher printing costs than expected. An Army official stated that the MultiCam® supplier is in the process of increasing the number of manufacturers licensed to print the camouflage pattern.

Objective 3: Cross Service Warfighter Equipment Board Provides a Forum to Share Technology

- The Cross Service Warfighter Equipment Board provides a forum that gives the services an opportunity to present their uniform technology to other services. For example, in March 2009 the Army reported on improvements they made to their Army Combat Shirt, worn under body armor.
- Outside of the Cross Service Warfighter Equipment Board, camouflage patterns have been shared.
 - Special Operations Command provided camouflage patterns to the Navy for its new camouflage uniforms.
 - In July 2009, the Marine Corps provided its urban digital camouflage pattern to the Coast Guard.

Objective 4: DOD Does Not Collect Risk Data on Individuals in Different Uniforms

- The services and U.S. Central Command (CENTCOM) officials do not collect data that would enable an assessment of the risks associated with individuals¹¹ wearing different uniforms in combat operations.
- However, in July 2009 a Multi-National Force-Iraq subordinate command memo acknowledges the potential risk to individuals in different clothing. The memo requested that interpreters be allowed to wear a military uniform to blend with forces and minimize the risk of being singled out for attack.

¹¹ Including military individual augmentees, in-lieu of forces, joint duty assignees, civilians, and contractors.

Objective 4: CENTCOM Combatant Commander Can Determine Uniform Wear of Individuals

- The Combatant Commander and Service Component Commanders maintain flexibility to determine which uniform is worn based on operational needs.
- DOD Instruction 3020.41 indicates that generally commanders are not to allow contractors to wear military uniforms. However, geographic combatant commanders may authorize the wearing of military uniforms for operational reasons.¹²
- In CENTCOM's area of responsibility, the combatant command and each service have issued policies on ground combat uniform wear. (See appendix IV, table 3.)
 - In general, individual augmentees or other military support personnel wear the Desert Camouflage Uniform (DCU).
 - In general, DOD civilians and contractors may wear civilian clothing or, when authorized, the DCU; interpreters wear civilian clothes and, when authorized, the DCU or the uniforms of the service they support.
- In other combatant commands, officials indicated that there is no specific policy on the dress of civilian support personnel. (See appendix IV, table 4.)

¹² Distinctive elements should be added to the uniform to distinguish military and nonmilitary personnel.

- **Appendix I:**

National Defense Authorization Act for fiscal year 2010, Sec. 352

- **Appendix II:**

Current and Planned Service Ground Combat Uniforms

- **Appendix III:**

Ground Combat Uniform Costs (FY 2001-2010)

- **Appendix IV:**

Camouflage Uniform Wear Policies of the Combatant Commands

- **Appendix V:**

Detailed Scope and Methodology

Section 352 of the National Defense Authorization Act for fiscal year 2010¹³ requires GAO to assess the ground combat uniforms and camouflage utility uniforms currently in use by DOD, including:

1. The overall performance of each uniform in various anticipated combat environments and theaters of operations.
2. Whether the uniform design of each uniform conforms adequately and is interoperable with currently issued personal protective gear and body armor.
3. Costs associated with the design, development, production, procurement, and fielding of existing service-specific ground combat and camouflage utility uniforms.
4. Challenges and risks associated with fielding members of the Armed Forces into combat theaters in unique or service specific ground combat or camouflage utility uniforms, including the tactical risk to the individuals serving in individual augmentee, in-lieu of force, or joint duty assignments of use of different ground combat uniforms in a combat environment.
5. Implications of the use of patents and other proprietary measures that may preclude sharing of technology, advanced uniform design, camouflage techniques, and fire retardence.
6. Logistical requirements to field and support forces in varying combat or utility uniforms

¹³ Pub. L. No. 111-84, § 352(b) (2009).

Appendix II: Air Force Airman's Battle Uniform (ABU) and Airman's Battle Ensemble (ABE)



Source: U.S. Air Force.

ABU

- Specifications: Permanent press, non-flame resistant, non-permethrin treated
- Unit cost (Man's blouse/trouser): \$76.20
- Unit cost (Woman's blouse/trouser): \$75.40
- Number of sizes:
 - Woman's blouse sizes: 33
 - Woman's trouser sizes: 35
 - Man's blouse sizes: 44
 - Man's trouser sizes: 43

ABE

- Specifications: Flame resistant, non-permethrin treated.
- The flame resistant fabric for the ABE is proprietary.
- Unit cost (Blouse/tman's rouser): \$203.34
- Unit cost (Blouse/woman's trouser): \$200.53

Appendix II

Army Combat Uniform (ACU)



Source: U.S. Army.

ACU

- Specifications: ACU can be non-flame resistant, non-permethrin treated.
- Unit cost (blouse/trouser): \$75.85
- Number of sizes
 - Blouse sizes: 37
 - Trouser sizes: 36

Flame Resistant ACU

- Specifications: Flame resistant and permethrin treated or flame resistant and non-permethrin treated.
- Rayon fabric blend for the flame resistant uniform is patented and trademarked by a private company.
- Unit cost (blouse/trouser): \$129.61
- Unit cost permethrin treated (blouse/trouser): \$152.34

Appendix II Army MultiCam®



MultiCam®

- Specifications: Flame resistant and permethrin treated
- Estimated unit cost (blouse/trouser): \$173.93¹³
- Number of sizes
 - Blouse sizes: 37
 - Trouser sizes: 36

Source: U.S. Army.

¹³ Army officials indicated that they expect the price of the uniform to decrease when more manufacturers are licensed to print the camouflage pattern.

Marine Corps Combat Utility Uniform Desert (MCCUU Desert)



MCCUU Desert

- Specifications: Permethrin treated and permanent press, non-flame resistant
- Unit cost (blouse/trouser): \$77.90
- Number of sizes:
 - Blouse sizes: 37
 - Trouser sizes: 37
- The Department of the Navy and Marine Corps hold the patent for the desert and woodland MCCUU pattern, fabric, and design, which includes the eagle, globe, and anchor.
- Flame Resistant Organizational Gear (FROG) is worn for combat missions.

Source: U.S. Marine Corps.

Marine Corps Combat Utility Uniform Woodland (MCCUU Woodland)



MCCUU Woodland

- Specifications: Permethrin treated and permanent press, non-flame resistant
- Unit cost (blouse/trouser): \$77.65
- Number of sizes
 - Blouse sizes: 37
 - Trouser sizes: 37
- The Department of the Navy and Marine Corps hold the patent for the desert and woodland MCCUU pattern, fabric, and design, which includes the eagle, globe, and anchor.
- Flame Resistant Organizational Gear (FROG) is worn for combat missions.

Source: U.S. Marine Corps.

Appendix II

Navy DOD Desert Camouflage Uniform (DCU)



DCU

- Specifications: Non-flame resistant, non-permethrin treated
- Unit cost (blouse/trouser): \$61.60
- Number of sizes:
 - Blouse sizes: 28
 - Trouser sizes: 24

Source: U.S. Navy.

Appendix II

Navy DOD Woodland Camouflage Utility Uniform (CUU)



CUU Woodland

- Specifications: Non-flame resistant, non-permethrin treated
- Unit cost (blouse/trouser): \$48.46
- Number of sizes:
 - Blouse sizes: 31
 - Trouser sizes: 24

Source: U.S. Navy.

Appendix II: Navy Working Uniform Type II Desert and Type III Woodland Uniforms (In Development)



Type II and Type III

- Specifications: Non-flame resistant, non-permethrin treated
- Estimated unit cost (blouse/trouser): \$83.00
- Number of sizes:
 - Blouse sizes: unknown
 - Trouser sizes: unknown
- Navy officials indicated that they are considering patenting the Type II and Type III uniforms and embedding the anchor, the Constitution, and an eagle emblem on the uniforms.

Source: U.S. Navy.

Appendix II

Navy Working Uniform (NWU)



NWU

- This uniform, which replaced six working uniform options, is not a ground combat uniform.
- Specifications: Non-flame resistant, non-permethrin treated, permanent press and treated with soil release
- Unit cost (blouse/trouser): \$76.50
- Number of sizes:
 - Blouse sizes: 42
 - Trouser sizes: 39

Source: U.S. Navy.

Appendix III

Ground Combat Uniform Costs (FY 2001-FY 2010)

- Because ground combat uniforms were developed at different times and include different characteristics, the costs reported in table 2 include different years and different uniforms.
 - Design and Development costs range from fiscal year 2001 through 2010 and include the Air Force ABU, the Army's ACU, the MultiCam®, the Marine Corps' desert and woodland utility uniforms, and the Navy's Type II and Type III uniforms.
 - Production and Procurement and Storage and Distribution costs range from fiscal year 2005-2010 and include Air Force ABU, the Army's ACU, the Marine Corps' desert and woodland utility uniforms, the Desert Combat Uniform, and Combat Utility Uniform.

Table 2. Ground Combat Uniform Costs (FY 2001-FY 2010)

	Design and development Service data (FY 2001-2010)	Production and procurement DSCP Obligations (FY 2005-2010)	Distribution and storage Commercial and DSCP (FY 2005-2010)
Air Force	\$ 3,164,000	\$198,731,403	\$7,727,376
Army	6,640,000	1,241,602,034	4,823,664
Marine Corps	319,000	173,796,280	1,409,088
Navy	8,386,000	105,623,784	369,456
DSCP			52,317,751
Totals by Phase	18,509,000	1,719,753,501	66,647,335

Source: GAO Analysis of DOD data.

Note: The distribution and storage costs are for uniforms as well as additional clothing and textiles.

Table 3. Ground Combat Uniform Policies and Practices Vary in CENTCOM by Service

	Policy for military personnel	Policy for civilian personnel
CENTCOM	Each service wears its own ground combat uniform. Air Force and Navy augmentees are generally issued the Desert Camouflage Uniforms (DCU).	DOD contractors and civilians may wear DCU if Combined Joint Operating Area commander identifies an operational need. Interpreters wear civilian clothes or, when authorized, a government-issued uniform or the uniform of the service they support.
Air Force	Airmen wear ABU or Desert Flight Duty Uniform (DFDU). Airmen performing ground combat operations are authorized to wear Airman Battle System-Ground	DOD civilians may wear the ABU, when authorized by the commander. DOD contractors may wear the ABU or DCU, when authorized by the combatant commander.
Army	Soldiers wear the Army Combat Uniform (ACU). Air Force and Navy augmentees and other assigned personnel may be issued the ACU.	DOD civilians and contractors may be issued the DCU when authorized by the theater or Joint Operating Area commander. DOD civilians and contractors are not issued the ACU.
Navy	Sailors wear the DCU or uniforms of services they are assigned to support.	DOD contractors generally have not worn the DCU unless they are supporting units in forward operations.
Marine Corps	Marines wear the Combat Utility Uniform (MCCUU) Desert and/or flame resistant ensemble. Navy augmentees and other assigned Navy personnel may wear the MCCUU and have worn the flame resistant ensemble.	DOD civilians and interpreters are not authorized to wear the MCCUU. They may wear a DCU or flight suit, when authorized.

Source: U.S. Central Command, U.S. Air Forces Central, U.S. Army Central, U.S. Naval Forces Central Command, and U.S. Marine Corps Forces Central Command.

Table 4. Combatant Command Ground Combat Uniform Policies and Practices

- Combatant Command officials confirmed that the following are the uniform policies for their region.

	Policy for military personnel	Policy for civilian personnel
AFRICOM	Military personnel and augmentees wear their combat uniform: Air Force-BDU or ABU; Army-ACU; Navy-CUU; Marine Corps- MCCUU	DOD civilians, contractors, and interpreters wear civilian clothes. Changes to the uniform policy are determined by the commander.
CENTCOM	See CENTCOM Table	See CENTCOM Table
EUCOM	Military personnel and augmentees wear their combat uniform: Air Force-BDU or ABU; Army-ACU; Navy-CUU; Marine Corps-MCCUU	No specific policy for DOD civilians, contractors, and interpreters. Contractors are prohibited from wearing military uniforms unless authorized by the combatant commander.
PACOM	Military personnel and augmentees wear their combat uniform: Air Force-ABU or BDU; Army-ACU; Navy-BDU or NWU; Marine Corps- MCCUU	No specific policy for DOD civilians, contractors and interpreters. Civilian clothes are worn unless a military uniform is authorized by the service component commanders.
SOCOM	Military personnel and augmentees wear their Service specific combat uniform: Air Force-ABU or BDU; Army-ACU or MultiCam®; Navy-DCU, CUU, AOR 1 or AOR 2; Marine Corps-MCCUU	No specific policy for DOD civilians, contractors, and interpreters. The respective combatant commander decides uniform wear for civilian support personnel.
SOUTHCOM	Military personnel and augmentees wear their combat uniform: Air Force-ABU; Army –ACU; Navy- CUU; Marine Corps-MCCUU.	No specific policy for DOD civilians, contractors and interpreters. The service component commander may determine changes to the uniform policy.

Source: U.S. Africa Command, U.S. Central Command, U.S. European Command, U.S. Pacific Command, U.S. Special Operations Command, and U.S. Southern Command.

Appendix V

Detailed Scope and Methodology

- To determine the extent to which ground combat uniforms meet standards for performance in combat environments, we reviewed uniform specifications provided by the Defense Supply Center Philadelphia and the services. We analyzed uniform performance feedback provided by the Army, Marine Corps, and Air Force. We discussed performance standards and feedback for combat environments with all four service's officials. To assess the extent to which ground combat uniforms and protective gear and body armor are interoperable, we collected data from each service about their protective gear and uniform operability standards. We discussed interoperability of uniforms and protective gear with service and Special Operations Command officials. We did not test uniforms and protective gear for interoperability.
- To assess costs and logistics support requirements with the design, development, production, procurement, and fielding of service-specific ground combat uniforms, we analyzed uniform budget and cost estimate data on current and planned ground combat uniforms from the services and the Defense Supply Center Philadelphia. We did not assess the Defense Supply Center Philadelphia uniform management costs. To determine the reliability and accuracy of the Army, Navy, and Marine Corps cost estimates, we used the GAO Cost Estimating and Assessment Guide. See slide 53. In addition, we collected ground combat uniform storage cost data incurred by the supply center, commercial entities, and the services. We discussed the cost and budget data, the systems used to maintain the data, and testing they conduct to ensure reliability of data with DOD officials. We found that the data were sufficiently reliable for the purpose of reporting costs and trends in costs.

Appendix V

Detailed Scope and Methodology

- To determine the extent to which patents and proprietary information might preclude sharing of advanced uniform technology, we identified elements of the uniforms that are patented or proprietary. We collected data on how the services and Special Operations Command share uniform technology. We discussed the uniform elements and the impact of patents and proprietary elements on sharing uniform technology among service and Special Operations Command officials.
- To assess the challenges and risks associated with individuals serving in combat assignments where different ground combat uniforms are worn, we analyzed the uniform policies of the combatant commands and service components of U.S. Central Command. We reviewed the Army's contracting data on interpreter uniform requirements. We also discussed risks to augmentees, interpreters, and other support personnel with service and Special Operations Command officials.

Appendix V

Detailed Scope and Methodology

We assessed the cost estimate and budget data using the 12 steps in GAO's Cost Estimating and Assessment Guide to determine if the cost estimates and budget data were well-documented, comprehensive, accurate, and credible.

- A well-documented estimate includes source data, clear and detailed calculations, a purpose, and an explanation of the methods and references used.
- A comprehensive estimate is detailed, ensures that costs are neither omitted or double counted, and accounts for ground rules and assumptions.
- An accurate estimate is unbiased, not overly conservative or optimistic, and is based on an assessment of the most likely costs.
- A credible estimate ensures limitations, uncertainties, and biases are discussed and considered, varies major assumptions, and includes a sensitivity and risk analysis to determine the risk in the estimate.

Appendix V

Detailed Scope and Methodology

- Our review focused on the current Army, Air Force, Navy, and Marine Corps ground combat uniforms and the development of future ground combat uniforms.
- We visited or contacted the following organizations during our review:
 - Office of the Secretary of Defense
 - Under Secretary of Defense for Acquisition Technology & Logistics (Land Warfare & Munitions)
 - Assistant Deputy Undersecretary of Defense Logistics and Materiel Readiness (Supply Chain Integration)
 - Defense Logistics Agency
 - Defense Supply Center Philadelphia
 - Army:
 - Office of the Assistant Secretary of the Army (Acquisition, Logistics and Technology)
 - Office of the Deputy Chief of Staff Logistics (G-4), Personnel (G-1), Operations (G-3/5/7)
 - Army Program Executive Office (PEO) Soldier
 - Army Materiel Command
 - Natick Soldier, Research, Development, and Engineering Center
 - Maneuver Center of Excellence
 - Training & Doctrine Command, Accelerated Capabilities
 - Intelligence and Security Command, Operations

Appendix V

Detailed Scope and Methodology

- We visited or contacted the following organizations during our review:
 - Air Force:
 - Deputy Chief of Staff, Installations, Logistics and Mission Support, Materiel Support Division
 - Deputy Chief of Staff Services, Personnel and Manpower, Uniform and Recognitions Branch
 - Air Force Uniform Board
 - Air Force Materiel Command
 - 303rd Aeronautical Systems Wing
 - 670th Aeronautical Systems Squadron
 - 648th Aeronautical Systems Squadron
 - Air Force Special Operations Command
 - 2nd Air Force (Joint Expeditionary Tasking)
 - Navy
 - Office of the Assistant Secretary of the Navy Research, Development & Acquisition
 - Office of Chief of Naval Operations, Logistics Operations & Policy
 - Naval Facilities Engineering Command
 - Navy Uniform Board
 - Naval Supply Systems Command, Navy Clothing and Textile Research Facility
 - Naval Expeditionary Combat Command, Logistics Policy & Concepts Branch
 - Naval Special Warfare Command
 - Naval Exchange Command

Appendix V

Detailed Scope and Methodology

- We visited or contacted the following organizations during our review:
 - Marine Corps
 - Office of the Assistant Secretary of the Navy Research, Development & Acquisition
 - Headquarters Marine Corps, Programs, Plans, & Operations (PP&O), Ground Combat Element Branch, Infantry Section
 - Headquarter Marine Corps, Office of Counsel
 - Office of Legislative Affairs, USMC Congressional Liaison
 - System Command
 - Infantry Combat Equipment
 - Combat Equipment Support Systems
 - Marine Corps Uniform Board
 - Combat Development Directorate—Fires, Maneuver, Integration Division
 - Combatant Commands
 - U.S. Africa Command, U.S. Central Command, U.S. European Command, U.S. Pacific Command, U.S. Southern Command
 - CENTCOM Service Component Commands for the Army, Navy, Air Force, and Marine Corps
 - U.S. Special Operations Command

Appendix V

Detailed Scope and Methodology

We conducted this performance audit from December 2009 through May 2010 in accordance with generally accepted government auditing standards. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our audit objectives. We believe that the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objectives.

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